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# Dental Material

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Lecture 2

## Dental material

### Elastic impression material

**Elastic impression materials:** are those materials which can be withdrawn from tooth and tissue undercuts without permanent deformation and remain in an elastic flexible state after their removal from the patient mouth. These materials are mostly used for making impression for complete and partial dentures.

#### Type of elastic impression material

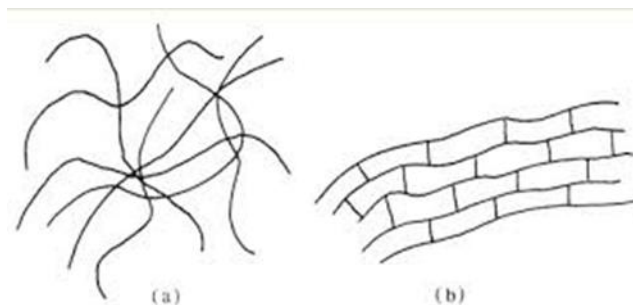
Hydrocolloids and elastomers

**Hydrocolloids :** Hydro (aqueous) means water. Colloid means gelatin substance. Hydrocolloid impression materials are colloidal suspension of polysaccharide in water.

The colloid can exist in two forms; viscous liquid known as sol or solid form known as gel.

In sol form (fluid) there is random arrangement of polysaccharide chain (a)

In gel form the polysaccharide chain becomes aligned & the material becomes viscous & develop elastic properties (b) as seen in the figure below:



**Gelation:** is the process of conversion of sol to gel which lead to development of elastic properties system with polymers

**Hydrocolloids can be subdivided in two types based on mode of gelation:**

- a. Irreversible hydrocolloids: e.g. alginate
- b. Reversible hydrocolloids: e.g. agar

**A- Alginate impression material:**

Alginate is Hydrophilic, chemical setting (it change from sol to gel by chemical reaction). It is most widely used impression materials in dentistry. Supplied as a powder mixed with water.



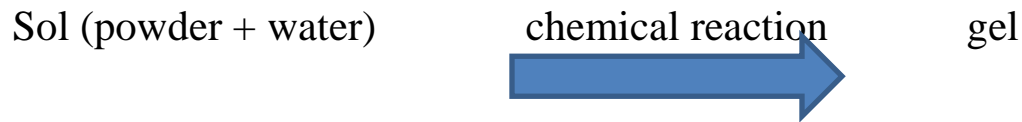
**Uses**

For taking impression of partial dentures and complete dental prosthesis

Note: it is not recommended for crown and bridge work.

## Setting reaction

When the powder & water are mixed, a chemical reaction occurs transforming the sol into gel.



## Casting the models:

Impression should be washed with water to remove saliva, excess water is removed then poured immediately, if not the impression should be covered with a damp piece of cotton.

If too much water covers the impression, the gel will absorb water and swell because of **imbibitions**. (absorption of the liquid on the surface of the gel)

If the Impression is left on the bench, it will lose water and shrink because of **syneresis** (exudation of the liquid on the surface of the gel)



### **Properties:**

1. There is regular setting (2-4.5 minutes) & fast setting (1-2 minutes). To increase setting time mixing with cold water is used. Also high water to powder ratio will increase setting time.
2. The impression should be left in the mouth for (2-3) minutes after initial set to allow for the development of additional strength . When we remove the tray from patient's mouth, we should avoid rocking movement because it will cause distortion and tearing for the material. So removal should be done with one quick movement(snap removal)
3. Poor dimensional stability because of syneresis (loss of water loss from the colloid leading to shrinkage) & imbibition (water absorption from the surrounding leading to increase in volume of the impression) , therefore the cast should be poured immediately.
4. The cast should not remain in contact with the alginate impression for period of hours because contact of set gypsum with alginate will affect surface quality of the cast.
5. Thin layers of alginate are weak. The thickness of alginate impression between the tray & tissue should be at least 3mm.
6. Record fine details adequately, but not as good as that with agar or Elastomers.
8. Low cost, very easy to be used and pleasant tasting.

## **B- Agar impression material:**

Agar is hydrophilic , physical reaction . it is supplied as gel in plastic tubes or bulk containers



### **Uses:**

- 1- Duplication of casts and dentures.
- 2- Taking impressions for partial dentures or crowns and bridges

### **Manipulation of agar:**

Agar should be heated to (70-100° c) in a special container, then cooling to (46°c) to be loaded to the tray and inserted in the patient's mouth then cooled to (30° c) and then removed. To do such complex manipulation, Agar hydrocolloid requires special equipment which are Hydrocolloid conditioner and Water cooled rim lock tray:

a- Hydrocolloid conditioner

Specially designed conditioning bath (Temperature controlled water

bath) consist of three chambers; each containing water at different temperature which are:

1- Boiling section ( liquefaction section)

Water bath at (100°C) for 10 minutes, agar should not be reheated more than 4 times. The tube of agar is placed in this chamber for 1 minutes.

2- Storage section

Water bath at (65-68° c) when agar can be stored in the sol condition till needed.

3- Tempering section

Water bath at (46° c) to reduce the temperature so that it can be tolerated by the sensitive oral tissue (inside patient's mouth) .It also make the material viscous.



b- Water cooled rim lock tray:

Rim-lock tray with Water circulated at (18 to 21 ° c) through the tray to

accelerate setting of agar as seen in the picture below.



**Properties:**

1. Provides very accurate reproduction of surface details because in sol form agar is fluid.
2. Poor dimensional stability because of syneresis and imbibitions. Should be poured with gypsum immediately but if you can't, wrap the impression with wet towel to reduce dimensional changes.
3. Low tear resistance but it is better than alginate.
4. Removed by a rapid snap action to reduces the permanent deformation.
5. It is cheap & used in some laboratories for making duplicate models as it can be recycled up to four times.
6. Need special equipment such as Hydrocolloid conditioner and water cooled tray which is very bulky and there is an initial cost in providing this equipment.

**Thank you**